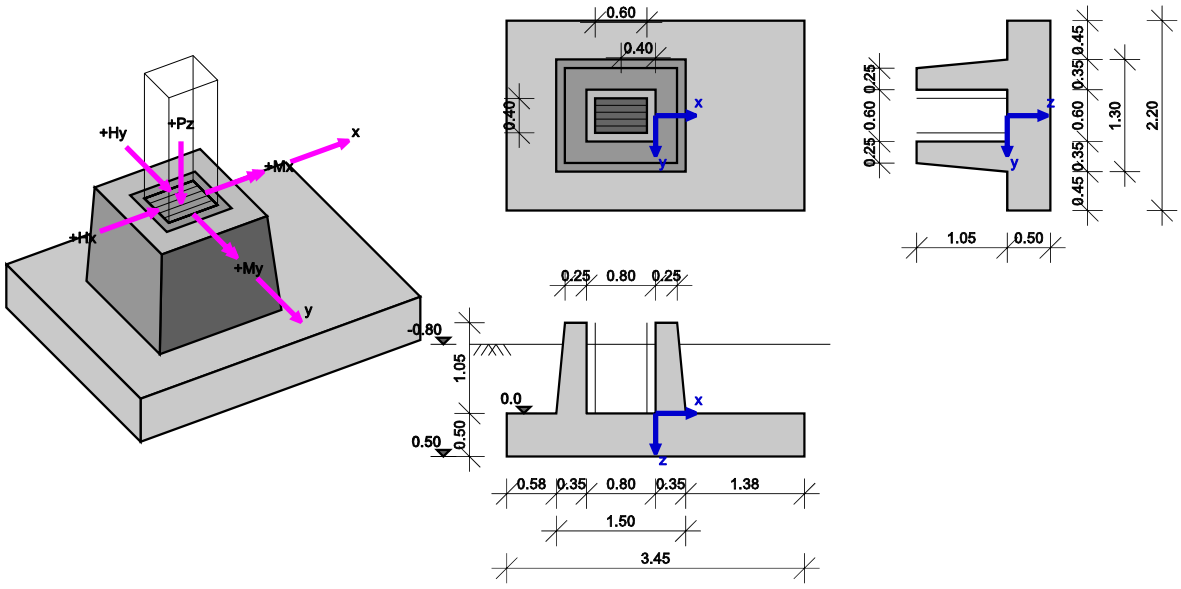
System information



Soil engineering: DIN EN 1997-1 Design:DIN EN 1992-1-1
Design situation: permanent

Material coefficient, reinforced concrete (C25/30, B500S)

Concrete	γ_c	$\gamma_{c,accid.}$	α_{cc}	γ_B [kN/m³]	f_{ck} [MN/m²]	f_{cd} [MN/m²]
C25/30	1.50	1.30	0.85	25.00	25.00	14.17

Reinforcement	γ_s	$\gamma_{s,accid.}$	f_{yd} [MN/m²]	f_{yk} [MN/m²]	f_{tk} [MN/m²]
B500S	1.15	1.00	434.78	500.00	540.00

Subsoil geometry and material

h_e [m]	t_w [m]	φ [°]	c [°]	tan $\delta_{s,f}$ [°]	γ_1 [kN/m³]	γ_2 [kN/m³]
0.800	0.500	33.00	0.00	0.649	20.00	20.00

σ_{Rd}= 300.00 kN/m², User-defined

Loading

Load cases

LC	I	LC_I	Source	Type of action	Name
0				Dead load	
1				Permanent load	
2				Storage rooms (Live load E)	
3				Wind	
4				Snow	LF 4

Dead load sum LC 0

LC	Type	A_L [m²]	q_z [kN/m]	P_z [kN]	e_x [m]	e_y [m]
0	F	7.59	28.5	216.3	0.000	0.000
0	F	1.68	26.3	44.1	-0.400	0.000
0	F	1.68	-16.0	-26.9	-0.400	0.000

Column loads and imported loads

Type: S = column loads; I = imported loads; c = characteristic; d = design

LC	Type	P_z [kN]	H_x [kN]	H_y [kN]	M_x [kNm]	M_y [kNm]	ΔM_{xII} [kNm]	ΔM_{yII} [kNm]	e_x [m]	e_y [m]
1	S,c	257.0	0.0	0.0	0.0	-96.0	0.0	-48.0	-0.400	0.000
2	S,c	373.0	20.0	0.0	0.0	-180.0	0.0	-106.0	-0.400	0.000
3	S,c	0.0	35.0	0.0	0.0	-90.0	0.0	0.0	-0.400	0.000
4	S,c	322.0	0.0	0.0	-220.0	0.0	0.0	0.0	-0.400	0.000

Load case combinations

decis.= 'yes' ... Combination is decisive in an analysis

LCC	decis.	Type	Crit.	Combination

Geotechnical analyses

Analysis of the safety against displacement (2nd order theory γ-fold)

Analysis format: $M_{dst,d} \leq M_{stb,d}$

LCC	$M_{x,stb}$ [kNm]	$M_{x,dst}$ [kNm]	$M_{y,stb}$ [kNm]	$M_{y,dst}$ [kNm]	dst/stb
1	485.6	0.0	860.3	850.3	0.99
7	751.3	165.0	860.3	850.3	0.99

Decisive load case combination: LCC1, η=0.99 **Analysis fulfilled**

Analysis of the base pressure action effects (2nd order theory γ-fold)

Analysis format: $\sigma_d \leq \sigma_{Rd}$

LCC	$P_{res,d}$ [kN]	e_x [m]	e_y [m]	$A_{red,c}$ [m²]	σ_d [kN/m²]	σ_{Rd} [kN/m²]	σ_d/σ_{Rd}
6	1705	0.13	-0.19	5.82	293	300	0.977

Decisive load case combination: LCC6, η=0.98 **Analysis fulfilled**

Foundation rotation and limitation of a gaping joint (2nd order theory, characteristic)

Analysis format: $e_x/b_x \leq 1/6$; $e_y/b_y \leq 1/6$; $(e_x/b_x)^2+(e_y/b_y)^2 \leq 1/9$

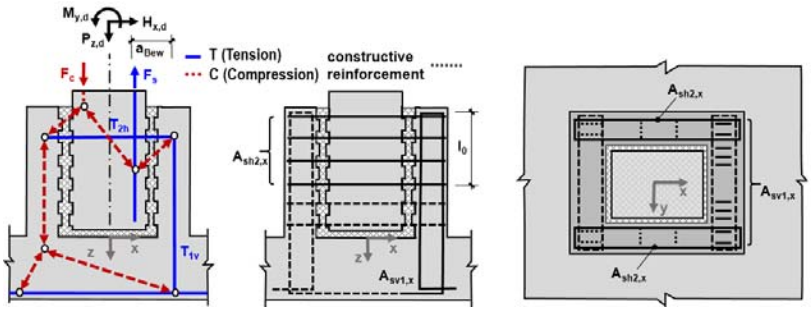
LCC	$P_{res,G,c}$ [kN]	$e_{x,G}$ [m]	$e_{y,G}$ [m]	$P_{res,P,c}$ [kN]	$e_{x,P}$ [m]	$e_{y,P}$ [m]	$CW1_x$	$CW1_y$	CW2	$1.KW_x$ [%]	$1.KW_y$ [%]	1.CW [%]	2.CW [%]
1	491	0.07	0.00	864	0.40	0.00	0.02	0.00	0.01	12.2	0.0	12.2	12.2
2	491	0.07	0.00	491	0.36	0.00	0.02	0.00	0.01	12.2	0.0	12.2	10.0
3	491	0.07	0.00	491	0.07	0.00	0.02	0.00	0.00	12.2	0.0	12.2	0.4
4	491	0.07	0.00	491	0.07	0.00	0.02	0.00	0.00	12.2	0.0	12.2	0.4
5	491	0.07	0.00	1025	0.22	-0.11	0.02	0.00	0.01	12.2	0.0	12.2	5.8
6	491	0.07	0.00	1186	0.13	-0.19	0.02	0.00	0.01	12.2	0.0	12.2	7.8
7	491	0.07	0.00	1025	0.28	-0.11	0.02	0.00	0.01	12.2	0.0	12.2	7.9

1. core width: Decisive LCC1, η=0.12 **Analysis fulfilled**

2. core width: Decisive LCC1, η=0.12 **Analysis fulfilled**

Reinforced concrete design

Sleeve design with profiled joint according to Schlaich/Schäfer



Composite condition

	f_{ck} [N/mm²]	f_{bd} [N/mm²]	f_{yd} [N/mm²]	Composite
Column	45	5.98	435	Composite conditionwell
Sleeve	25	4.09	435	Composite condition good

Formwork:	profiled	Thickness of mortar d_t:	0.050 m
$A_{sx,exis}$ of the vertical reinforcement:	18.10 cm²	$A_{sy,exis}$ of the vertical reinforcement:	0.00 cm²
Vertical reinforcement, sleeve d_s:	12 mm	Vertical reinforcement, column d_s:	25 mm

Design

As-direction	LC C	$M_{x,d}$ [kNm]	$M_{y,d}$ [kNm]	$P_{z,d}$ [kN]	$H_{x,d}$ [kN]	$H_{y,d}$ [kN]
x A_{sv}	1	-	758.4	906.5	82.5	-
y A_{sv}	6	330.0	-	1389.5	-	0.0
x A_{sh}	1	-	758.4	906.5	82.5	-
y A_{sh}	6	330.0	-	1389.5	-	0.0

Column

t_{exis} [m]	t_{req} [m]	t_{sugg} [m]	$a_{reinf,x}$ [m]	$a_{reinf,y}$ [m]
1.000	0.755	0.900	0.300	0.300

As-direct.	d_s[mm]	T_{1v} [kN]	$A_{sv1,req}$[cm²]	$A_{sv1,exis}$[cm²]	a_n [m]	l_{bd} [m]	l_0 [m]
x	25	1059.48	24.4	29.4	0.231	0.341	0.524
y	25	533.48	12.3	12.3	0.232	0.272	0.465

Sleeve

As-direct.	d_s[mm]	T_{1v} [kN]	$A_{sv1,req}$[cm²]	$A_{sv1,exis}$[cm²]	a_n [m]	l_{bd} [m]	l_0 [m]	T_{2h} [kN]	A_{sh2} [cm²]
x	12	737.17	17.0	18.1	0.233	0.209	0.292	744.67	17.1
y	12	273.24	6.3	6.3	0.234	0.223	0.312	273.24	6.3

Punching analysis

Punching analysis - Design values based on2nd order theory γ-fold

LCC	V_{Ed} [kN]	σ_{0d} [kN/m²]	$V_{Ed,Red}$ [kN]	β [-]	a_{crit} [m]	d_m [m]	$as_{x,t}$ [cm²/m]	$as_{y,t}$ [cm²/m]	v_{Ed} [MN/m²]	$v_{Rd,max}$ [MN/m²]
ρ_l [%]	A_{crit} [m²]	U_{crit} [m]	U_{out} [m]	U_0 [m]	L_w [m]	a_{crit}/d_m [-]	$as_{x,b}$ [cm²/m]	$as_{y,b}$ [cm²/m]	$v_{rd,c}$ [cm²/m]	$v_{Ed}/v_{Rd,c}$ [-]
6	1389.5	183.1	678.5	1.46	0.35	0.48	0.00	0.00	0.279	1.414
0.000	3.88	7.39	8.29	5.20	0.14	0.73	0.00	0.00	1.010	

No punching reinforcement required.

Analysis overview

Analysis	Status	LCC	Utilization
Safety against displacement	fulfilled	1	0.99
Base pressure (2.o.th)	fulfilled	6	0.98
1.core width (2.o.th)	fulfilled	1	0.12
2.core width (2.o.th)	fulfilled	1	0.12